An affordable dual-socket, dual- and quad-core SMP server with high performance and data protection for small and medium businesses

Pocket Guide
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IBM System x3400

Product Overview

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Outstanding performance, capacity and availability

[**Suggested uses:** *Small/medium businesses, large multilocation enterprises and bank branch offices seeking scalability, top performance and new availability features at an entry-level price.*]

The **dual-socket** IBM® System **x3400**, incorporating IBM **X-Architecture**™ features, provides outstanding value to workgroups by combining scalable performance and availability features at an outstanding price. The x3400 supports the latest **quad-** and **dual-core** Intel® **Xeon**™ processors, designed with up to a leading-edge **1333MHz** front-side bus (FSB), **64-bit extensions** (**EM64T**), either **4MB** (dual-core) or **8MB** or **12MB** (quad-core) of L2 cache and **Hyper-Threading Technology**, to help provide you with the computing power you need to match your business needs and growth. In addition, the x3400 uses industry-standard **fully buffered 667MHz** memory with **Chipkill**™ **ECC** (Error Checking and Correcting) protection—for high performance and reliability. For even higher levels of availability, the x3400 also offers a choice of optional online hot-spare memory or memory mirroring. An integrated high-speed **Gigabit Ethernet** controller is standard, as are high-performance adapter slots (**PCI-E x8** and **x4** and **PCI-X**/**133**).

All models offer impressive scalability, including dual-processor support, up to **32GB** of memory and up to **four simple-swap Serial ATA II** (SATA II) hard disk drives with a total capacity of up to **3.0TB**[1]**,** or up to **four** high-performance **hot-swap Serial-Attach SCSI** (SAS) drives with an internal storage capacity of **1.2TB**. Specific models support an upgrade kit that increases **hot-swap** support to **eight SATA or SAS** drives (**6.0TB** or **2.4TB**, respectively). For additional performance and high availability, the x3400 includes the *hardware*-based **ServeRAID-8k-l** controller *standard*, with **32MB** of cache, providing **RAID-0**/**1**/**10** support. Additional RAID support is available via the optional IBM ServeRAID™ family of SAS/SATA and Ultra320 SCSI controllers. The x3400 ships as a tower unit; an optional **rack conversion kit** turns the x3400 into a **5U** rack-mounted server to save precious data center floor space.

Standard in the x3400 is a **Baseboard Management Controller (BMC)** that enables users to manage and control the server easily—both locally and remotely. This high level of manageability is designed to keep costs down and the system up—even when network usage increases. Other advanced features that help maximize network availability by increasing uptime, include **simple-swap** or **hot-swap**/**redundant HDDs**, **hot-swap**/**redundant power** and **fans**; **Active Memory**™; integrated **RAID**; **temperature-controlled fans** with **Calibrated Vectored Cooling**™; industry-standard **IPMI 2.0** support, including **highly secure remote power control** and **Serial over LAN**; as well as **text-console redirect over LAN**.

With the inclusion of unique IBM service and support features such as **IBM Director**, **IBM ServerGuide**™ and support for the optional **IBM Remote Supervisor Adapter II SlimLine**, the x3400 is equally well designed for a locally managed data center environment as for a remotely managed or stand-alone environment, while offering maximum availability.

For a balance of high-performance dual-core, dual-socket processing, high availability and vast internal SAS storage at a budget price, the x3400 is the ideal system.

Selling Features

Price/Performance

The x3400 offers numerous features to boost performance and reduce product and operating costs:

- Up to **two multi-core** Xeon processors with high-end **1066MHz** or **1333MHz** front side bus and either **12MB**, **8MB** or **4MB** (processor-specific) of integrated Level 2 cache per processor offer superior performance capable of tackling the toughest jobs. **64-bit extensions** provide the flexibility to run 32-bit and 64-bit applications concurrently.
- **Low-voltage processors** draw less power and produce less waste heat than high-voltage processors, thus helping to reduce data center energy costs. Some **dual-core** Xeon processors use only **65W**. This is half the wattage consumed by older 130W processors. On a per-core basis, the **80W quad-core** processors are even more economical, consuming only **20W** per core, vs. **32.5W** per core for the 65W dual-core processors.

[1] GB equals 1,000,000,000 bytes and TB equals 1,000,000,000,000 bytes when referring to hard disk drive capacity. Accessible capacity may be less.

- Ultra-fast **fully buffered 667MHz PC2-5300 DDR II** ECC memory with **Chipkill** protection provides speed and high availability.
- Three **high-speed PCI-E** and two **PCI-X** adapter slots offer investment protection by supporting high-performance adapters, such as 10Gb Ethernet, Fibre Channel and InfiniBand cards, none of which will run in older 33MHz and 66MHz conventional PCI slots.
- Integrated **ServeRAID-8k-l** provides *hardware* **RAID-0**/**1**/**10** support with **32MB** of cache at no extra charge and without consuming a valuable adapter slot. RAID-0 offers improved disk performance via data striping; RAID-1 offers disk mirroring for high availability, and RAID-10 combines the benefits of speed and availability. The x3400 is upgradeable to full **RAID-0**/**1**/**1E**/**5**/**6** support, using the optional **ServeRAID-8k** card. It also offers higher performance, due to the **256MB** battery-backed onboard cache.
- Support for up to **four 3.5-inch hot-swap SAS** hard disk drives standard offer high-performance with high availability. Some models also offer an optional upgrade to **eight hot-swap SAS** or **SATA** drives. The SAS controller provides full-duplex (**2 x 300MBps**) data transfers for SAS drives. For lower cost and high capacity, other models support up to **four simple-swap Serial ATA** drives. The SATA II drives offer performance nearly equal to that of Ultra320 SCSI (300MBps half-duplex vs. 320MBps half-duplex, respectively).
- The integrated **Gigabit Ethernet** controller with **IPMI 2.0** support provides high-speed network communications.
- A **high degree of device integration**, including SAS/SATA, RAID, Gigabit Ethernet, systems management and video controllers, lowers costs and frees up valuable adapter slots.

Flexibility

The x3400 has the ability to grow with your application requirements, thanks to:

- Support for a choice of **quad-core** processors with **2.0** to **2.66GHz** clock rates, **1333MHz** FSB, and **80W** power draw.
- Support for a choice of **dual-core** processors with **1.6** to **3.0GHz** clock rates, **667MHz** or **1066MHz** FSB, and **65W** or **95W** power draw.
- Up to **32GB** of high-speed fully-buffered DDR2 system memory.
- **Three** *available* **high-performance PCI-E** adapter slots, **two PCI-X** slots, and one **legacy PCI** slot in all models.
- The standard **ServeRAID-8k-l** controller can be upgraded to the slotless **ServeRAID-8k** controller. It offers **256MB** of battery-backed cache and **six** RAID levels.
- The **five USB 2.0** ports (four external, one *internal*) are up to **40X** faster[2] than older **USB 1.1** ports. This provides speedy access to external HDDs (non-arrayed), optical drives, internal and external tape drives, and other USB devices. Two ports are on the front of the unit and two are on the back, for easy access.
- **Up to four** internal **3.5-inch simple-swap SATA** or **hot-swap SAS or SATA HDDs** and a **half-** or **full-high tape drive** standard. Selected models offer an optional expansion kit that supports **four** additional **hot-swap SAS** or **SATA** drives, for a total of **eight**. This translates into as much as **6TB** of internal SATA or **2.4TB** of internal SAS storage (model-specific). This provides tremendous internal storage capability, along with full data backup.
- Alternatively, iSCSI or Fibre Channel-attached storage can be attached using **IBM System Storage**™ or IBM **TotalStorage**™ servers.

Manageability

Powerful systems management features simplify local and remote management of the x3400:

- The x3400 includes a **Baseboard Management Controller (BMC)** to monitor server availability, perform Predictive Failure Analysis, etc., and trigger IBM Director alerts.
- Integrated **IPMI 2.0** support alerts IBM Director to anomalous environmental factors, such as voltage and thermal conditions. It also supports **highly secure remote power control** using data encryption.
- **Text Console Redirection** support allows the administrator to remotely view x3400 text messages over Serial or LAN.
- IBM **Director 5.1x** is provided for proactive systems management. It comes with a portfolio of tools, including *Management Processor Assistant, RAID Manager, Update Assistant, Software Distribution* and a *Real Time Diagnostics* tool. In addition, IBM Director offers extended systems management tools for additional server management and increased availability.
- An optional **Remote Supervisor Adapter II SlimLine** provides additional systems management capabilities, including *Web-based out-of-band control; virtual floppy and optical drive support; Windows "blue screen" error capture; LDAP and SSL support;* and *remote redirection of PCI video, text,*

[2] Data transfer rates may be less than the maximum possible.

keyboard and mouse. It also adds *PFA support for fans*. And it does all this without consuming a valuable adapter slot.

Availability and Serviceability

The x3400 provides many features to simplify serviceability and increase system uptime:

- x3400 servers use **Chipkill-enabled fully buffered** memory DIMMs. Chipkill memory is up to **16X** better than standard ECC memory at correcting memory errors. This can help reduce downtime caused by memory errors. **Fully buffered DIMMs** provide additional availability features, including CRC (cyclic redundancy check) monitoring.
- The x3400 offers selectable **online hot-spare memory** and **memory mirroring** for redundancy in the event of a noncorrectable memory failure.
- **Toolless cover removal** provides easy access to upgrades and serviceable parts. Similarly, the **Remote Supervisor Adapter II SlimLine**, **simple-swap** or **hot-swap/redundant HDDs, hot-swap/redundant fans** and **power supplies** (model-specific), as well as **online hot-spare** and **mirrored** memory can be installed and replaced without tools, meaning greater system uptime while these components are being serviced.
- Integrated **RAID-1/10** or optional **RAID-1E, 5** or **6 arrays** allow the server to keep operating in the event of a drive failure
- **IPMI 2.0** supports highly secure remote system power control using data encryption. This allows an administrator to restart a server without having to visit it in person, saving travel time and getting the server back up and running quickly and securely. It also adds new features to those provided by IPMI 1.5, including **VLAN** support, **Serial over LAN**, enhanced authentication and encryption algorithms (**RMCP+, SHA-1, AES**) and a **firmware firewall**.
- **Temperature-controlled fans** adjust to compensate for changing thermal characteristics. At the lower speeds they draw less power and suffer less wear. Equally important in a crowded data center, temperature-controlled fans produce less ambient noise in the data center than if they were constantly running at full speed.
- The **three-year (parts and labor) limited onsite warranty**[3] offered on selected Machine Types (**7374** and **7376**) affords you peace of mind and greater investment protection than a one-year warranty does.

Key Features

High-Performance Xeon Processors

The x3400 supports up to two high-performance Intel Xeon processors, allowing you to upgrade to a second processor as business needs require. The x3400 offers a choice of processor clock rates, FSB speeds and power draw:

- **80W quad-core** Xeon processor models **E5405, E5410, E5420,** or **E5430** at 2.0, 2.33, 2.5, or 2.66GHz (respectively), with 64-bit extensions, *reduced power draw*, a **1333MHz** FSB, and **12MB** of **shared** L2 processor cache (2x6MB)
- **80W quad-core** Xeon processor models **E5310** or **E5320** at 1.6 or 1.86GHz (respectively), with 64-bit extensions, *reduced power draw*, a **1066MHz** FSB, and **8MB** of **shared** L2 processor cache (2x4MB)
- **65W** dual-core Xeon processor models **5110** or **5120** at 1.6 or 1.86GHz (respectively), with 64-bit extensions, *low power draw*, a **1066MHz** FSB, and **4MB** of shared L2 processor cache (1 x 4MB)
- **95W** dual-core Xeon processor model **5050** at 3.0GHz, with 64-bit extensions, *reduced power draw*, a **667MHz** FSB, **4MB** of L2 processor cache (2 x 2MB), and Hyper-Threading Technology

Dual-core Xeon processors contain **two complete processor cores**; **quad-core** processors, similarly, contain **four** cores. Processors contain one or two **shared 2MB, 4MB**, **8MB** or **12MB** L2 caches. The shared cache is dynamically allocated between the cores as needed. The multiple cores appear to software as multiple physical processors. The dual-core processors offer considerably higher performance than a same-speed Xeon processor with a single core. Likewise, quad-core processors offer considerably higher performance than a same-speed Xeon processor with dual cores.

Intel **Extended Memory 64 Technology (EM64T)** 64-bit extensions allow the Xeon processor to use large memory addressing when running with a 64-bit operating system. This in turn lets individual software processes directly access more than 4GB of RAM, which was the limit of 32-bit addressing. This can result in much higher performance for certain kinds of programs, such as database management and CAD. Additional registers and instructions (SSE3) can further boost performance for applications written to use them. Contact your software provider to determine their software support for EM64T.

The **1066MHz** FSB (which connects memory to the processor) boasts a peak rate of **8.53GBps**, or up to **one-third** higher throughput at the same processor clock speed than an **800MHz** FSB (**6.4GBps**) used in older systems. The **1333MHz** FSB offers a peak rate of **10.67GBps**, or up to **two-thirds** higher throughput at the same processor clock speed than an **800MHz** FSB. This may result in much higher data transfer

[3] For terms and conditions or copies of the IBM Statement of Limited Warranty, call 800-772-2227 in the U.S. In Canada call 800-426-2255. Telephone support may be subject to additional charges. For warranties including onsite labor, a technician is sent after IBM attempts to resolve the problem remotely. International warranty service is available in any country in which this product is sold.

rates.

Intelligent Power Capability powers individual processor elements on and off as needed, to reduce power draw.

Execute Disable Bit functionality can help prevent certain classes of malicious buffer overflow attacks when combined with a supporting operating system.

DDR II ECC Fully Buffered Memory with Chipkill Protection

The x3400 supports up to **32GB** of memory in **8** DIMM sockets. It uses **PC2-5300 fully-buffered** double data rate II (DDR II) memory (operating at **667MHz**) for faster access, and provides advanced **Chipkill** memory protection, for **up to 16X** better error correction than standard ECC memory.

The fully buffered memory in the x3400 provides up to **triple** the memory bandwidth (up to **21.3GBps** in *four* channels of PC2-5300 fully-buffered DIMMs vs. a maximum of 6.4GBps in two channels of unbuffered PC2-3200 memory) and up to **triple** the system memory capacity (**12** DIMMs x **4GB**) of the predecessor x236 server (8 DIMMs x 2GB). By performing reads and writes simultaneously, it eliminates the previous memory read-to-write blocking latency. In addition, it also offers innovative data reliability and security features to help improve data integrity, including enhanced CRC protection, data retry on error detect and buffer registers for improved fault isolation.

For increased availability, the x3400 offers two additional (but mutually exclusive) levels of IBM Active Memory protection: online **memory mirroring**, and **online hot-spare memory**.

Memory mirroring works much like disk mirroring. The total memory is divided into two channels. Data is written concurrently to both channels. If a DIMM fails in one of the DIMMs in the primary channel, it is instantly disabled and the mirrored (backup) memory in the other channel becomes active (primary) until the failing DIMM is replaced. Mirroring can be accomplished with multiples of *four* DIMMs (one pair per memory channel).

When *online hot-spare memory* is enabled, using single and/or dual-rank DIMMs **one rank** is set aside per channel as online spares in case one of the other ranks in that channel fails. *The spare rank must have capacity at least that of the largest active rank.* (In other words, if a combination of 2GB and 4GB DIMMs are used in a branch, one rank on each 4GB DIMM will be used for sparing.) In an x3400 with **32GB** installed, up to **24GB** (using 8 *dual*-rank 4GB DIMMs) of memory is available when the hot-spare feature is active.

Either of these features requires operating system support.

When multiples of four DIMMs (4 or 8) are installed, the x3400 operates in **four-way interleaved** mode, for higher performance. When only two DIMMs are used, the system defaults to **two-way interleaved** mode.

DIMMs must be installed in pairs. Memory is available in kits consisting of *two* **512MB**, **1GB, 2GB** or **4GB** DIMMs.

Hot-Swap/Redundant Components

System availability is maximized through the extensive use of hot-swap and redundant components, including:

- **Redundant memory protection** (with online hot-spare memory or memory mirroring enabled)
- **Hot-swap, redundant hard disk drives** (with **RAID-1**/**10** protection standard, and **RAID-1E**/**5**/**6** protection optional)
- **Hot-swap, redundant power supplies** (optional, model-specific)
- **Hot-swap, redundant cooling fans** (optional, model-specific)

Large HDD Storage Capacity

The x3400 offers a choice of disk storage, supporting up to **four** 3.5-inch **simple-swap** Serial ATA (**SATA**) drives or **four hot-swap** high-performance Serial-Attach SCSI (**SAS**) drives standard. Using the optional **Hot-Swap SAS**/**SATA 4-Pac HDD Option** upgrade kit on selected models, up to **eight** 3.5-inch **hot-swap SAS** or **SATA** drives can be installed:

SAS

- **10,000** RPMs — 146.8 or **300GB** (**2.4TB** maximum, using 4-Pac upgrade kit)
- **15,000** RPMs — 73.4 or **146.8GB** (**1.17TB**, using 4-Pac upgrade kit)

SATA

- **7,200** RPMs — 160, 250, or **500GB** (**2.0TB**)—simple-swap
- **7,200** RPMs — 160, 250, or **500GB** (**4.0TB**, using 4-Pac upgrade kit)—hot-swap

Notes: Hot-swap and simple-swap SATA drives offer exactly the same reliability as fixed SATA drives. Only the system *availability* improves using the swappable drives. (Less downtime is incurred removing

and installing the drives.) Hot-swap SAS drives use the Converged Tray for interchangeability with other IBM System x™ systems.

If you need more storage space, terabyte capacities are possible with external direct-attach, NAS and SAN solutions.

Drive Bays

All x3400 models contain **7** drive bays standard. **Hot-swap** models are upgradeable to **11**. All models offer **three 5.25-inch** bays and **four 3.5-inch** HDD bays. Some models support up to four hot-swap SAS or SATA drives; other models support up to four simple-swap SATA drives. The optional upgrade kit adds a drive cage containing four more **hot-swap** bays. This enables the installation of up to eight slimline (1.0") SAS or SATA drives.

An internal **full-high** tape drive can be installed using both available 5.25-inch drive bays; alternatively, an internal **half-high** tape drive can be installed using **one** of the 5.25-inch drive bays. The tape drive must have a **USB 2.0** interface. A **16X**[4] speed half high CD-ROM drive with a SATA interface ships standard in the other 5.25-inch bay. No diskette drive is supplied with any model; an external USB floppy drive may be used, if needed.

Hot-swap and simple-swap drives may be inserted or removed through the front of the server. **Hot-swap** drives *do not* require powering off the system. **Simple-swap** SATA drives *do* require powering off the system first; however, no tools or jumpers are required for installation and removal, allowing for faster, simpler servicing than fixed drives.

For still more storage, a direct-attach, NAS or SAN external expansion option can be added, using an optional controller.

Disk/Tape Controllers

Some x3400 models include an integrated eight-port **Adaptec AIC9580W Serial-Attach SCSI (SAS)** controller. Other x3400 models include a **SATA** controller, integrated in the Intel chipset.

The integrated **SAS** controller supports up to **four** internal **SAS** or **SATA** LVD (low-voltage differential) **hot-swap** drives standard , and provides data transfer speeds of up to **300MB** per second[5] in *each* direction (**full-duplex**) across the SAS bus, for an aggregate speed of **600MBps**, nearly double that of Ultra320 SCSI's **320MBps** (half-duplex) bandwidth. The serial design of the SAS bus allows maximum performance to be maintained as additional drives are added. This controller also supports up to **eight** Serial ATA II **(SATA II)** drives at SATA II throughput (**300MBps, half-duplex**). The **Hot-Swap SAS/SATA 4-Pac HDD Option** allows the installation of up to **four** additional **(eight total) hot-swap SAS** or **SATA** drives.

The integrated **ServeRAID-8k-l** controller in the hot-swap models offers *hardware* **RAID-0/1/10** support and **32MB** of fast **PC2-4200 DDR2** cache for SAS or SATA drives. The **ServeRAID-8k** option adds **three** additional RAID levels, **RAID-1E, 5** and **6**, along with **256MB** of cache memory for higher performance, and battery backup, *without* consuming a valuable adapter slot.

The integrated **SATA II** controller (simple-swap SATA models only) supports up to **four** internal **simple-swap** LVD SATA drives. It provides *firmware-based* **RAID-0/1** support standard. The system can be upgraded to *hardware*-based **RAID-0/1/10/1E/5/6** for higher performance, using the same IBM **ServeRAID-8k SAS/SATA** controller as the hot-swap server models.

Other supported RAID controllers include:

- **ServeRAID-8s** — **SAS/SATA**, 8-lanes, **256MB** cache (optional battery-backup), x8 PCI-E (4 lanes internal, 4 external; four-port cable for external SAS/SATA RAID storage)

In addition, the **Ultra320 SCSI Controller 2** supports the use of an internal SCSI tape drive.

Internal Backup

The x3400 supports several internal **tape backup** options. Supported technologies include:

- **DDS-5** (half-high)
- **DDS-6** (half-high)
- **LTO-2 Ultrium** (half-high)
- **LTO-3 Ultrium** (full-high)
- **VXA-3** (half-high)

High-Performance Adapter Slots

The x3400 provides **two x8** ("by 8") **4GBps PCI-E (PCI Express) full-length/full-height** adapter slots (**Slots 2** and **3**). Each is capable of supporting **x1/x4/x8** adapters at full speed. **Slot 1** is a **half-length/full-height x4** (2GBps) **PCI-E** slot; **Slots 4** and **5** are **full-length/full-height** (1GBps) **133MHz PCI-X** slots.

[4] Variable read rate. Actual playback speed varies and is often less than the maximum possible.
[5] Data transfer rates depend on many factors and are often less than the maximum possible.

and **Slot 6** is a **half-length/full-height 33MHz** legacy **PCI** slot.

PCI-Express is a high-performance, low-latency, next-generation serial I/O bus that is rapidly replacing the older parallel PCI and PCI-X buses. A **x8** PCI-E adapter offers approximately *four times* the maximum throughput of a 133MHz PCI-X adapter[6]. (A **x1** adapter offers throughput similar to a **66MHz** PCI-X slot.)

Because the **SAS**, **ServeRAID-8k-l** or **8k**, **Gigabit Ethernet**, **systems management** and **video** controllers are integrated onto the system board, the six adapter slots are all *available*, which offers you a wide degree of latitude in expansion options.

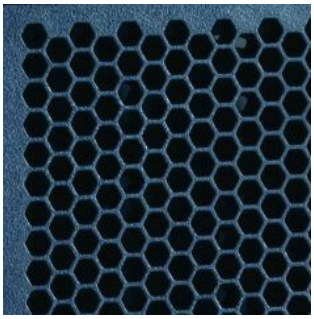
Gigabit Ethernet Controller

The x3400 includes **one** integrated **Broadcom 5721** Gigabit Ethernet controller for up to 10X higher maximum throughput than a 10/100 Ethernet controller.

It also supports highly secure remote power management using **IPMI 2.0**, plus **Wake on LAN®** and **PXE** (Preboot Execution Environment) flash interface. Optional PCI adapters offering failover and load balancing between adapters are available for added throughput and increased system availability.

Temperature-Controlled Fans

Strategically located fans, combined with efficient airflow paths, provide highly effective system cooling for the x3400, known as **Calibrated Vectored Cooling**. The base server with one power supply includes **three hot-swap** fans. Adding the optional power supply for redundant power (selected models) also adds **three** more hot-swap fans, for redundant cooling. In addition, each power supply contains a fan.



The system contains **three cooling zones**. **Zone 1** (incorporating one fan in a nonredundant configuration or two with redundancy) cools the **memory slots** and the three **5.25-inch drive bays**. **Zone 2** (one or two fans) cools the **processors**, and **Zone 3** (one or two fans) cools the **adapter slots** and the **HDD bays**.

The fans automatically adjust speeds in response to changing thermal requirements, from a minimum of **1,000** RPMs to a maximum of **4,800** RPMs, depending on the zone, redundancy, and internal temperatures. When the temperature inside the server increases, the fans speed up to maintain the proper ambient temperature. When the temperature returns to a normal operating level, the fans return to their default speed. Why not simply run the fans at 100% capacity all the time? For several good reasons: to reduce the ambient noise, reduce the wear-and-tear on the fans and reduce the server power draw. The reduction in ambient noise and power draw may be relatively minor for a single server, but put dozens or hundreds in a data center and it can make a big difference!

In addition, the server uses **hexagonal ventilation holes** in the chassis. Hexagonal holes can be grouped more densely than round holes, providing greater airflow through the system cover.

This cooling scheme is important because newer, more powerful processors generate a significant amount of heat, and heat must be controlled for the system to function properly.

Other Features

- **Five USB 2.0 ports** — Provides flexibility to add high-speed external devices. The USB 2.0 specification supports up to 480Mbps transfer rates. (Note: Not all USB 2.0 devices are capable of achieving this rate.) Two ports are provided on the front of the server, two are on the back, and one is internal to support a USB-interface tape drive.
- **Remote Supervisor Adapter II SlimLine support** — This optional full-function systems management adapter adds local and remote management functions without consuming an adapter slot.
- **Dual video ports** — An **ATI Radeon ES1000** SVGA video controller provides up to **1024x768** resolution, with a color depth of **32** bits at **75Hz** refresh rate. To simplify local systems management, **one** video port is provided on the front of the unit and **one** on the back.
- **Toolless chassis** — The cover can be opened without tools, and many components can be removed and replaced without tools, including the CD-ROM drive, hot-swap HDDs, plus PCI, PCI-X and PCI-E adapters, as well as the integrated ServeRAID-8k and Remote Supervisor Adapter II SlimLine. This can save a servicer significant time.

Rack Cable Management and KVM Console Switching

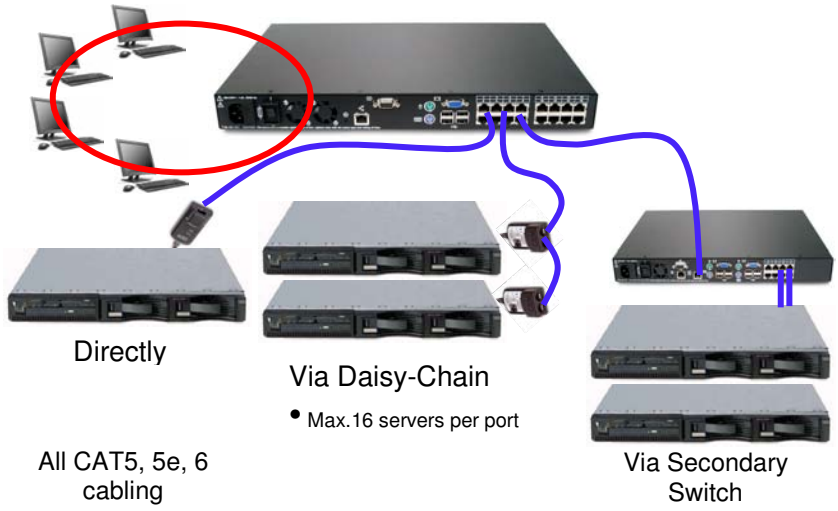
IBM Advanced Cabling Technology (**ACT**) is an optional feature that offers many advantages over standard KVM cabling across the entire System x and xSeries product line. So now you can interconnect all of your servers with one smart cabling architecture. ACT cabling eliminates the need for one-to-one direct connections between each server and a KVM switch by using a daisy-chain approach.

The snarl of cabling behind most racks is at best inconvenient to work around and at worst an expensive logistical nightmare, requiring the rewiring of servers, PDUs, KVM switches, and other equipment whenever a rack server is added or removed. Even worse, the veil of cables blocks rack airflow and can actually contribute to equipment failure due to overheating. ACT cabling is the solution for reducing

[6] Actual throughput will depend on the adapter vendor's implementation.

behind-the-rack cabling by as much as **87%**.

The illustration below shows a sample ACT configuration:



Conventional cabling has bulky KVM cables exiting each server, which then connect to a KVM switch. The cables exiting a series of KVM switches must then be aggregated via additional KVM switches and PDUs, which only increases the number—and cost—of cables, KVM switches and PDUs. Instead, the daisy-chain approach of ACT cabling uses readily available, inexpensive CAT5 and 6 cabling to considerably *reduce* the number of cables, KVM switches, and PDUs needed, rather than increasing them. If a server is removed or added, no complicated rewiring is needed. One cable connects the first server in the rack to the next, and so on. Up to **16** servers form a chain; up to **8** chains can connect to one Local Console Manager (LCM); **16** LCMs can connect to one Global Console Manager (GCM). In this manner, up to **2,048 servers** can be centrally managed. Equally importantly, with ACT—unlike some other offerings—everything is done externally via cabling; *no* special adapters are required.

Extensive System Support Features

The IBM services and technical support portfolio provides world-class, consistent, high-quality service and support. The x3400 server offers a number of tools and services designed to make ownership a positive experience. From the start, IBM programs make it easier for you to plan for, configure and purchase System x or xSeries servers, get them running and keep them running long-term. These features include IBM Express Portfolio, IBM ServerProven®, the IBM Standalone Solutions Configuration Tool, IBM System x and BladeCenter Power Configurator, IBM ServerGuide, IBM Electronic Service Agent™, Product Customization Services and extensive technical support offerings.

This System x server is part of the **IBM Express Portfolio**, designed, developed and priced to meet the specific needs of midsized businesses. The IBM Express Portfolio of solutions is easy to acquire, install and manage. And they leverage IBM technology to provide tangible solutions to help you solve business problems in an on demand world.

The IBM **ServerProven** program provides the confidence that specific options and operating systems have been tested on the server and are officially supported to work together. It is updated frequently to ensure that the latest compatibility information is always at your fingertips.

The IBM **Standalone Solutions Configuration Tool** (SSCT) is a downloadable tool that simplifies the often complex chore of configuring a full rack of servers (including blade servers) and confirming that you have all the cables, power distribution units, KVM (keyboard, video and mouse) switch boxes and other components you need, as well as the proper airflow clearances, electrical circuits and other environmental conditions.

IBM **System x and BladeCenter Power Configurator** helps IT managers plan for data center power needs, by providing the following information for specific configurations of System x and BladeCenter systems: *power input* (watts), *PDU sizing* (amps), *heat output* (BTUs), *airflow requirements through chassis* (CFM), *VA rating*, *leakage current* (mA), and *peak inrush current* (amps).

IBM **ServerGuide** (installed from CD) simplifies the process of installing and configuring System x and xSeries servers. ServerGuide goes beyond mere hardware configuration by assisting with the automated installation of the Microsoft® Windows® Server 2000 and 2003 operating systems, device drivers and other system components, with minimal user intervention. (Drivers are also included for support of Novell NetWare, Red Hat Linux and SUSE LINUX.) This focus on deployment helps you reduce both your total cost of ownership and the complexity that administrators and technical personnel face.

IBM **Electronic Service Agent**™ is an innovative “call home” feature that allows System x and

BladeCenter servers to automatically report hardware problems to IBM support, which can even dispatch onsite service[7] if necessary to those customers entitled to onsite support under the terms of their warranty or an IBM Maintenance Agreement. Electronic Service Agent resides on a server and provides electronic support and problem management capabilities through a highly secure electronic dialogue between your systems and IBM. It monitors networked servers for hardware errors and it can perform hardware and software inventories and report inventory changes to IBM. All information sent to IBM is stored in a highly secure database and used for improved problem determination.

Additional services include hardware warranty upgrades and factory-installed **Product Customization Services** (PCS), such as asset tagging, hardware integration, software imaging and operating systems personalization.

IBM offers extensive **technical support** by phone and via the Web. Support options include links to forums/newsgroups, problem submission, online shopping support, service offerings, device drivers for all IBM product lines, software downloads and even upcoming technical seminar worldwide schedules and registration. Also available are remote installation, configuration and usage support for System x and xSeries hardware and software, as well as onsite custom services to provide the level of expertise you require.

Advanced Systems Management Capabilities

The x3400 has a high level of systems management capabilities that are well-suited to remote locations as well as to stand-alone environments. Features include the Baseboard Management Controller (BMC), Automatic Server Restart, Wake on LAN® support, PXE support, text console redirect, Predictive Failure Analysis, IBM Director and support for an optional Remote Supervisor Adapter II SlimLine.

The BMC provides industry-standard **Intelligent Platform Management Interface** (**IPMI**) **2.0**-compliant systems management. It provides a number of important system functions, including:

- Monitoring of system and battery voltage, system temperature, fans, power supplies, processor and DIMM status
- Fan speed control
- Product ID and Family ID detection
- Highly secure remote power on/off
- System reset control
- NMI/SMI detection and generation
- System diagnostic LED control (power, HDD, activity, alerts, heartbeat)
- IPMI over LAN
- Serial Over LAN
- Proxy server support
- LAN messaging and alerting
- Text console redirection over LAN
- VLAN support
- Enhanced authentication and encryption algorithms (RMCP+, SHA-1, AES)
- Local update of BMC firmware
- Firmware firewall
- Support for IPMI v2.0 compliant management software (e.g., xCAT)
- Other mandatory and optional IPMI BMC functions

The BMC alerts IBM Director to anomalous environmental factors, such as voltage and thermal conditions—even if the server has failed.

The x3400 also supports an optional IBM **Remote Supervisor Adapter II SlimLine** for additional systems management capabilities, including:

- Predictive Failure Analysis for system fans
- Graphical console redirection over LAN
- Web-based out-of-band control
- Windows “blue screen” capture
- Remote virtual floppy and CD-ROM
- High-speed remote redirection of PCI video, keyboard and mouse
- SSL (Secure Socket Layer) and LDAP (Lightweight Directory Access Protocol) support

Automatic Server Restart (ASR) helps reduce downtime by restarting the server automatically in the event of a system lockup. ASR technology is a combination of hardware circuitry tied into the server’s

[7] For onsite labor, IBM will attempt to diagnose and resolve the problem remotely before sending a technician.

system reset function and a device driver. As long as the server continues running, the ASR watchdog timer will keep being reset, but if the operating system crashes or the hardware freezes somehow the ASR software will be unable to reset the hardware timer. If the timer is not reset within five minutes, it automatically triggers the ASR hardware, which immediately restarts the server (and logs an ASR event with IBM Director). These features are designed so that *no more than five minutes can pass before the server is restarted*.

Wake on LAN permits the server to be remotely powered on if it has been shut off. Once powered up, the server can be controlled across the network, using the **Preboot Execution Environment** (PXE).

Like Wake on LAN, PXE is system firmware. It allows software such as the optional **IBM Remote Deployment Manager** to take control of a system before the BIOS, operating system or applications are loaded (using Wake on LAN/PXE) and lets an administrator perform many low-level tasks remotely that would otherwise require a visit to each system. These tasks may include such things as formatting a hard disk drive, updating system firmware, or deploying a Windows or Linux operating system.

Text Console Redirection support allows the administrator to remotely view x3400 text messages over serial or LAN. An optional upgrade to the **Remote Supervisor Adapter II SlimLine** adds graphical console redirect.

Predictive Failure Analysis (PFA) is designed to allow the x3400 to detect impending failure of supported components (processors, memory, voltage regulator modules (VRMs), power supplies and hard disk drives) *before* actual failure, and alert the administrator through IBM Director. This gives you the ability to replace the failing component *before* it fails, resulting in increased uptime.

IBM Director 5.x software for advanced workgroup management is included with the x3400. IBM Director comes with a portfolio of tools, including *Management Processor Assistant, Rack Manager, RAID Manager, Update Assistant and Software Distribution. System Availability* (a no-charge download) and *Capacity Manager* (sold separately) are available as add-ons for additional server management and increased availability. IBM Director provides a single uniform graphical interface for all of these systems management functions.

IBM Director enables you to customize thresholds and monitor system components (for things like temperature, voltage regulation, etc.) to help maximize uptime.

Key Options

IBM options for System x servers help you take your servers to a higher level

You can rely on System x options to supply a complete solution for your business needs. Options help you create an optimized server system to meet your data protection, storage and availability needs. Every IBM option is designed and tested for peak performance and flexibility, helping to maximize your return on investment. The combination of System x servers and options lets you keep your fingers on the pulse of your e-business.

Processors — The Intel Xeon processor provides high clock rates, dual-cores, 64-bit extensions, a large cache and advanced features for availability and manageability. Large cache size, combined with a fast **1066MHz** or **1333MHz** front-side, reduces memory latency and facilitates the movement of data through the processor and I/O devices. (***Note:*** System performance depends not only on the number of processors in the server but also on the power and functionality of each processor.) Adding a second processor may be a cost-effective way to achieve significant performance improvements.

Memory — Memory is a significant factor in systems application performance. Adding more memory to a System x server is one of the most effective ways to increase application performance. For best performance in a server with a dual-core processor, there should be twice as much memory available as for a single-core processor. The x3400 takes memory upgrades in pairs and provides either two-way or four-way interleaving (depending on the number of DIMMs installed).

Hard Disk Drives — IBM hard disk drives help you improve the transaction and cost performance of your System x servers. The choice of hard disk drives can be a critical aspect of maximizing the I/O throughput of the system. **SAS** hard disk drives are available for the x3400 with capacities up to **300GB** (3.5-inch) at **10,000** RPMs and up to **146.8GB** at **15,000** RPMs. SATA II hard disk drives are available with capacities up to **500GB** (3.5-inch) at **7,200** RPMs.

Backup Drives — Backup drives help you protect your data. IBM offers several choices of capacities and technologies, including **DDS-5**, **DDS-6**, **LTO-2**, **LTO-3**, and **VXA-3**.

Power Supply — The optional second power supply for the x3400 enables redundancy for hot-swap power (and adds three additional fans for increased cooling capacity and redundancy).

Remote Supervisor Adapter II SlimLine — The x3400 includes a plethora of systems management features built-in; however, sometimes additional management capability is needed. In those situations, the Remote Supervisor Adapter II SlimLine not only offers powerful new features, it does so without taking up a valuable PCI-X or PCI-E adapter slot, using a dedicated slot on the motherboard instead.

ServeRAID Controllers — System x servers using embedded ServeRAID-8k technology allow companies to build a reliable foundation for business-critical computing. IBM ServeRAID technology allows an array consisting of multiple physical hard disk drives to be treated as one logical drive. ServeRAID technology also allows data to be stored redundantly, across multiple hard disk drives—

enhancing both the integrity and the availability of the data. SAS and SATA ServeRAID controllers offer enhanced performance due to onboard processors and cache. Because IBM ServeRAID controllers can help significantly improve data transfer rates, this technology is extremely effective when implementing demanding, transaction-oriented applications. By employing the advanced fault tolerance of IBM ServeRAID technology, companies can effectively implement networked business systems that require large amounts of storage space for data and applications that must be available for their businesses to continue operating.

The optional slotless **ServeRAID-8k SAS/SATA** controller offers enhanced performance for internal drives vs. the integrated ServeRAID-8k-l controller, **256MB** of battery-backed cache memory, and supports **six** RAID levels: **0** (striping), **1** (mirroring), **10** (mirroring and striping), **1E** (enhanced mirroring, supporting odd numbers of drives), **5** (striping with parity), and **6** (striping with double parity).

The optional PCI-E **ServeRAID-8s SAS/SATA** controller offers enhanced performance for both internal and *external* drives. It provides **256MB** of cache (with optional battery backup), and supports the same 6 RAID levels as the ServeRAID-8k controller.

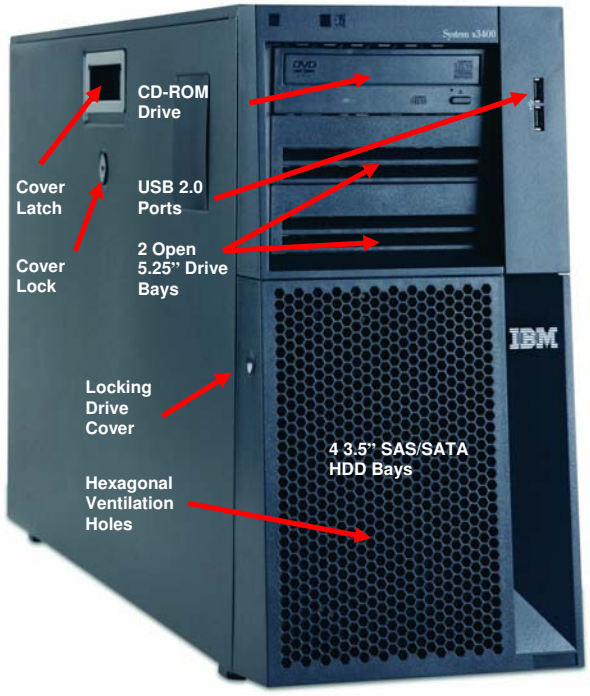
External Storage — The IBM **TotalStorage DS3000, DS4000, DS6000,** and **DS8000** series, as well as the **System Storage DS4000, N3000, N5000, and N7000** series, comprise a powerful and broad shared storage family with integrated management software designed to meet midrange and enterprise needs. For lower-end needs, IBM offers the TotalStorage **DS300** and **DS400** storage enclosures.

Additionally, external SAN, NAS and direct-attach storage is available using one of several IBM System Storage and TotalStorage host bus adapters.

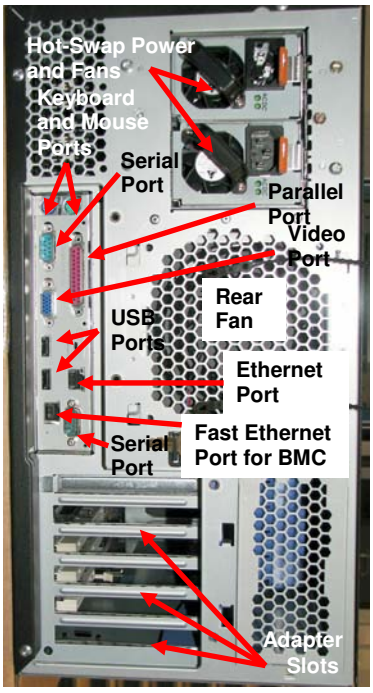
The **iSCSI HBA Adapter for IXA Connectivity** is a PCI adapter for selected System x and xSeries servers that provides a direct **1GBps** link to an IBM System i5 or iSeries server. This connection enables you to centralize their Microsoft Windows and System i5 or iSeries storage and consolidate the operations and backup of their System x, xSeries, System i5 and iSeries systems into a single infrastructure. It enables the tightest possible integration between Windows and System i5/iSeries data and applications, and allows as many as **32** servers to attach to one System i5 or iSeries system to share the iSeries server's systems management, DVD, tape and disk storage via the iSeries dynamic virtual storage architecture. This can take the place of a SAN if you have an established System i5 or iSeries infrastructure.

x3400 Images

Front View



Rear View



x3400 Specifications				
Machine type	**7973-1xX/1xY, 4xX/4xY, 5xX/5xY, AxX/AxY, DxX/DxY, JxX/JxY, LxX/LxY (Simple swap 1 yr. warr.)** **7974-1xX/1xY, 4xX/4xY, 5xX/5xY, AxX/AxY, DxX/DxY, JxX/JxY, LxX/LxY (Simple swap 3 yr. warr.)** **7975-1xX/1xY, 4xX/4xY, 5xX/5xY, AxX/AxY, BxX/BxY, CxX/CxY, DxX/DxY, JxX/JxY, LxX/LxY (Hot swap 1 yr. warr.)** **7976-1xX/1xY, 4xX/4xY, 5xX/5xY, AxX/AxY, BxX/BxY, CxX/CxY, DxX/DxY, JxX/JxY, LxX/LxY (Hot swap 3 yr. warr.)**			
Form factor	Tower (convertible to 5U rack)			
Processor type	**Quad-core** Intel **Xeon (54xx)** **2.0GHz** E5405 (AxX/AxY), **2.33GHz** E5410 (DxX/DxY), **2.5GHz** E5420 (JxX/JxY), **2.66GHz** E5430 (LxX/LxY),	**Quad-core** Intel **Xeon (53xx)** **1.6GHz** E5310 (BxX/BxY), **1.86GHz** E5320 (CxX/CxY)	**Dual-core** Intel **Xeon (51xx)** **1.6GHz** 5110 (4xX/4xY), **1.86GHz** 5120 (5xX/5xY)	**Dual-core** Intel **Xeon (50xx)** **3.0GHz** 5050 (1xX/1xY)
Maximum processor power draw	**65W** (4xX/4xY, 5xX/5xY)	**80W** (AxX/AxY), BxX/BxY, CxX/CxY, DxX/DxY, JxX/JxY, LxX/Lx)	**95W** (1xX/1xY)	
Front-side bus (FSB) speed	**1333MHz** (AxX/AxY, DxX/DxY, JxX/JxY, LxX/LxY)	**1066MHz** (4xX/4xY, 5xX/5xY, BxX/BxY, CxX/CxY)	**667MHz** (1xX/1xY)	
# of processors standard / maximum	1 / 2			
Internal L2 cache	**12MB** (2 x 6MB *shared* caches)—AxX/AxY, DxX/DxY, JxX/JxY, LxX/LxY	**8MB** (2 x 4MB *shared* caches)—BxX/BxY, CxX/CxY	**4MB** (1 x 4MB *shared* cache)—4xX/4xY, 5xX/5xY	**4MB** (independent 2MB cache *per core*)—1xX/1xY
Chipset	Intel 5000P			
Standard / maximum memory[8]	**1GB** (2 x 512MB) / **32GB**			
Standard memory type	**Fully buffered** PC2-5300 (**667MHz**) DDR II ECC with **Chipkill** protection			
Memory interleaving	Yes (four-way using multiples of 4 DIMMs; two-way with two DIMMs)			
DIMM capacities supported	512MB, 1GB, 2GB, 4GB			
# of DIMM sockets total / available	8 / 6			
# of DIMMs supported	2, 4, 8			
Online spare memory supported / # of DIMM sockets reserved for sparing	Yes / 1 DIMM "rank" per memory branch (2 ranks total)			
Memory mirroring supported / # of DIMM sockets reserved for mirroring	Yes / 4			
# of drive bays total / available	11 / 10 with upgrade (7975/7976)	7 / 6 standard (7975/7976)	7 / 7 (7973/7974)	
# of HDD drive bays total / available	**4** / **8** 3.5-inch SAS or SATA *with* upgrade (7975/7976)	**4** / **4** 3.5-inch SAS or SATA *standard* (7975/7976)	**4** / **4** 3.5-inch SATA (7973/7974)	
# of 5.25" bays total / available	3 / 2 (CD-ROM installed)			
Maximum HDD capacity standard	**1.2TB** (4 x **300GB**) **hot-**	**3.0TB** (4 x **750GB**) **hot-**	**3.0TB** (4 x **750GB**)	

[8] Maximum memory and disk capacity may require the replacement of standard components with the largest supported component available.

x3400 Specifications			
	swap **SAS**	swap **SATA**	**simple**-swap **SATA**
Maximum HDD capacity including Hot-Swap SAS/SATA 4-Pac HDD Option	**2.4TB** (8 x **300GB**) **hot**-swap **SAS**	**6.0TB** (8 x **750GB**) **hot**-swap **SATA**	**N/A**
HDD capacities supported	73.4, 146.8, **300GB** — **10K** RPMs; 73.4, **146.8GB** — **15K** RPMs	160, 250, 500, **750GB** — **7.2K** RPMs	
# of HDDs standard	None		
# of optical drives standard	1 **CD-ROM** (16X, in dedicated 5.25" bay)		
# of diskette drives standard	None (USB-attach)		
Internal tape drives supported	One **full-high** (uses two 5.25" bays); One **half-high** (uses one 5.25" bay)		
Disk drive technology	Hot-swap SAS/SATA	Simple-swap SATA	
Integrated disk controller	Eight-port Adaptec 9580W SAS/SATA	Four-port integrated SATA	
# of disk drives supported *per port*	1		
Integrated RAID controller / cache	ServeRAID-**8k-l** (**32MB** standard)—SAS models		
Optional RAID controllers supported	ServeRAID-**8k** (**256MB** standard)—SAS models		
# of adapter slots total / available	6 / 6		
# of PCI-E x8 slots (4GBps)	**2** full-height/full-length		
# of PCI-E x4 slots (2GBps)	**1** full-height/half-length		
# of PCI-X/133 slots (1GBps)	**2** full-height/full-length		
# of 33MHz legacy PCI slots	**1** full-height/half-length		
# of video ports	1		
Video controller	ATI Radeon ES1000		
Video memory	16MB SDRAM		
Maximum video resolution at 32-bit color	1024 x 768 x 32-bit color at 75Hz		
Gigabit Ethernet controller	Broadcom BCM5721		
# of Gigabit Ethernet ports	1 (rear)		
# of RS485 ports	None		
# of serial ports	2 (rear)		
# of parallel ports	1 (rear)		
# of PS/2 mouse ports	1 (rear)		
# of PS/2 keyboard ports	1 (rear)		
# of USB 2.0 ports	**4** *external* (2 front, 2 rear) ports, plus **1** *internal* USB connector for tape drive		
Integrated systems management controller	Yes (BMC)		
Optional systems management adapter	Remote Supervisor Adapter II SlimLine		
Light path diagnostics support	None		
Predictive Failure Analysis support	Processors, memory, voltage regulator modules (VRMs), HDDs, power supplies (plus fans, when an optional Remote Supervisor Adapter SlimLine II is used)		
Power supply size	**835W** universal, autoswitching (hot-swap	**670W** universal, autoswitching (simple-	

x3400 Specifications		
	models—7975/7976)	swap models—7973/7974)
# of power supplies standard / maximum	1 / 2	1 / 1
Hot-swap/redundant power supported	Yes / Yes (with two power supplies installed) — hot-swap models, 7975/7976)	N/A (simple-swap models—7973/7974)
# of fans/blowers standard / maximum	3 (with one power supply installed) / 6 (with redundant power installed) —hot-swap models, 7975/7976)	N/A (simple-swap models—7973/7974)
Hot-swap/redundant fans supported	Yes / Yes (with two power supplies installed) — hot-swap models, 7975/7976)	N/A (simple-swap models—7973/7974)
Maximum altitude	7,000 ft; 2,133 m	
Operating temperature range	50 – 95º F; 10 – 35º C (up to 7,000 ft / 2,133m)	
Operating humidity range	8-80%	
Dimensions (HWD) / weight	17.3" (439.4mm) **H** 8.6" (218.4mm) **W** 29.4" (747mm) **D** 30.4" (772mm) **D** (with redundant power)	75 **lb** (maximum) 34.0 **kg**
Operating systems supported	Microsoft Windows Server 2003 (Standard/Web/Enterprise Editions) 32/64-bit, Windows 2000 Server (Standard/Enterprise Editions), RHEL 3/4 32/64-bit, SLES 9 32/64-bit, Novell Open Enterprise Server (NetWare 6.5), VMware ESX Server 2.5/3.0	
Length of limited warranty	**3 years** (parts and labor)[9] — Machine Types **7374** and **7376**	**1 year** (parts and labor) — Machine Types **7373** and **7375**

The Bottom Line

The x3400 is an extremely powerful system, incorporating leading-edge industry-standard features and adding IBM-unique innovations:

Performance

- **High-throughput processors** — **1.6** to **2.66GHz quad-core** or **1.6** to **3.0GHz dual-core** Xeon processors
- **Large cache** — **12MB, 8MB** or **4MB** of L2 processor cache
- **64-bit extensions** (EM64T)
- **Leading-edge front-side bus** —Up to **1333MHz** FSB (model-specific)
- **Fast memory** — **Fully buffered 667MHz PC2-5300 DDR II** ECC memory standard with **two-way** or **four-way interleaving**
- **Fast disk technology** — Integrated **Serial-Attach SCSI (SAS)** controller (selected models) and slotless *hardware*-based **RAID** controller with **32MB** of onboard **cache standard** (upgradeable to **256MB** of battery-backed cache)
- **Fast communications** — Integrated **Gigabit Ethernet** controller
- **Fast I/O** —**PCI-E x8** and **x4** and **PCI-X/133** adapter slots

Flexibility

- **Large memory capacity** — Up to **32GB** of **fully buffered memory**, using **8** DIMMs
- **High-capacity disk storage** — Up to **2.4TB** of internal **hot-swap SAS** storage or **6.0TB** of **hot-swap SATA II** storage (using **eight** 3.5-inch drives), or up to **3.0TB** of **simple-swap SATA II** storage using **four** 3.5-inch drives)
- Support for an **optional half-high** or **full-high internal tape drive** (in *addition* to the eight HDDs)

[9] For terms and conditions or copies of the IBM Statement of Limited Warranty, call 800-772-2227 in the U.S. In Canada call 800-426-2255. IBM makes no representation or warranty regarding third-party products or services including those designated as ServerProven or ClusterProven. Telephone support may be subject to additional charges. For warranties including onsite labor, a technician is sent after IBM attempts to resolve the problem remotely. International warranty service is available in any country in which this product is sold.

- **High-performance external expansion** — **five** 480Mbps **USB 2.0** ports (two front, two rear, one internal)
- *Hardware*-based **RAID-0**/**1**/**10** support *standard* in **hot-swap** models (upgradeable to **RAID-0**/**1**/**10**/**1E**/**5**/**6** support); *firmware*-based **RAID-0**/**1** support *standard* in **simple-swap** models upgradeable to *hardware*-based **RAID-8k** support)
- **Six** *available* adapter slots —
  - **Two x8**[10] **PCI-E** slots (4GBps)
  - **One x4**[11] **PCI-E** slots (2GBps)
  - **Two 133MHz PCI-X** slots (1GBps)
  - **One 33MHz** legacy **PCI** slot
- Integrated **CD-ROM** drive
- Optional **iSCSI HBA Adapter for IXA Connectivity** (to System i™/iSeries™ servers)

Manageability, Serviceability and Availability

- IBM **Director** systems management software, including:
  - IBM Management Processor Assistant
  - IBM Rack Manager
  - IBM RAID Manager
  - IBM Update Assistant
  - IBM Software Distribution
  - IBM System Availability
- **Integrated Baseboard Management Controller** (BMC):
  - **IPMI 2.0** compliance, including highly secure remote power control
  - **Text console redirection** systems management standard
- **Active Memory protection:**
  - **Advanced Chipkill** ECC memory protection, and either
  - **Online hot-spare** memory, *or*
  - **Memory mirroring**
- Support for **highly available** *hardware*-based **RAID-1**/**10** arrays standard, without consuming an adapter slot; upgradeable to **RAID**-**1E**/**5**/**6** using a slotless card
- **Hot-swap SAS, hot-swap SATA** or **simple-swap SATA** hard disk drives
- **Ultra-efficient cooling** incorporating **Calibrated Vectored Cooling** features
- Optional **hot-swap**/**redundant power supplies and cooling**
- **Light path diagnostics** (front LED panel, externally viewable light path panel)
- Optional **Remote Supervisor Adapter II SlimLine** daughter card (no slot required)
  - Supports the **LDAP** and **SSL** industry standards
- Optional **tower-to-rack conversion kit**

[10] The x8 slots can accept x1, x4 or x8 adapters running at x1, x4 or x8 throughput, respectively.
[11] The x4 slot can accept x1, x4 or x8 adapters; however x8 adapters will be limited to x4 throughput.

For More Information

IBM System x and xSeries Servers	**ibm.com**/systems/x
Electronic Service Agent	**ibm.com**/support/electronic
IBM System x and BladeCenter Power Configurator	**ibm.com**/systems/bladecenter/powerconfig
Standalone Solutions Configuration Tool	**ibm.com**/servers/eserver/xseries/library/configtools.html
Configuration and Options Guide	**ibm.com**/servers/eserver/xseries/cog
ServerProven Program	**ibm.co**m/servers/eserver/serverproven/compat/us
Technical Support	**ibm.com**/server/support
Other Technical Support Resources	**ibm.com**/servers/eserver/techsupport.html

Legal Information

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MB, GB and TB = 1,000,000, 1,000,000,000 and 1,000,000,000,000 bytes, respectively, when referring to storage capacity. Accessible capacity is less; up to 3GB is used in service partition. Actual storage capacity will vary based upon many factors and may be less than stated.

Performance is in Internal Throughput Rate (ITR) ratio based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput that any user will experience will depend on considerations such as the amount of multiprogramming in the user’s job stream, the I/O configuration, the storage configuration and the workload processed. Therefore, no assurance can be given that an individual user will achieve throughput improvements equivalent to the performance ratios stated here.

Maximum internal hard disk and memory capacities may require the replacement of any standard hard drives and/or memory and the population of all hard disk bays and memory slots with the largest currently supported drives available. When referring to variable speed CD-ROMs, CD-Rs, CD-RWs and DVDs, actual playback speed will vary and is often less than the maximum possible.

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